FORM PTO-1390 U.S. DEPARTMENT OF COND (REV. 1-98)	ATTORNEY'S DOCKET NUMBER BIF103839					
TRANSMITTAL LETTER	U.S. APPLICATION NO. (If known, see 37 CFR 1.5					
DESIGNATED/ELECT	09/647546					
INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED				
PCT/FR99/00764	1 April 1999	2 April 1998				
TITLE OF INVENTION OPTICAL SYSTEM, IN PA	ARTICULAR INTRAOCULAR LENS	, CONTACT LENS				
APPLICANT(S) FOR DO/EO/US	onione Maurac					
Bernard FEURER and Monique MAUZAC  Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:						
	1. X This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.					
2. This is a SECOND or SUBSEQUEN	NT submission of items concerning a filing u	nder 35 U.S.C. 371.				
3. X This express request to begin national examination until the expiration of the	al examination procedures (35 U.S.C. 371(f)) ne applicable time limit set in 35 U.S.C. 371(	at any time rather than the TRAIL (b) and PCT Articles 22 and 39(1).				
4. X A proper Demand for International Pro	eliminary Examination was made by the 19th					
5. X A copy of the International Applicati	ion as filed (35 U.S.C. 371(c)(2))					
a. X is transmitted herewith (rec	driked outh it not mansmitted by the illetitud	onal Bureau).				
U. I has been transmitted by the	ication was filed in the United States Receiv	ing Office (RO/US).				
6. X A translation of the International Ap						
	ternational Aplication under PCT Article 19					
a. Late transmitted neteritar (	equired only if not transmitted by the Interna					
b. have been transmitted by t		onto has NOT expired				
d. have not been made; howe	ever, the time limit for making such amendm vill not be made.	sits has 1401 expired.				
8. A translation of the amendments to	the claims under PCT Article 19 (35 U.S.C.	371 (c)(3)).				
9. An oath or declaration of the inventor						
	nternational Preliminary Examination Repor	t under PCT Article 36				
(35 U.S.C. 371(e)(5)).						
Items 11. to 16. below concern docume	ent(s) or information included:					
11. X An Information Disclosure Statemen	nt under 37 CFR 1.97 and 1.98.					
12. An assignment document for record	ling. A separate cover sheet in compliance w	ith 37 CFR 3.28 and 3.31 is included.				
13. X A FIRST preliminary amendment.						
☐ A SECOND or SUBSEQUENT pre	liminary amendment.					
14. A substitute specification.						
15. A change of power of attorney and/	or address letter.					
16. X Other items or information:						
_	eliminary Examination Repo	rt.				
Search Report.						
Application Data	Sheet.	!				
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## 528 Rec'd PCT/PTO 0 2 OCT 2000

U.S.	APPLICATION NO. (IT)	9777777	112	ERNATIONAL APPLICATION NO. PCT/FR99/00764			ATTORNEYS DOC BIF1038.	
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17	17. X The following fees are submitted:							
٠.	BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):							
n	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO				-			
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1	Processing fee of \$130.00 for furnishing the English translation later than 20 30 \$ months from the earliest claimed priority date (57 CFR 1.492(f))  TOTAL NATIONAL FEE = \$ 990							
F	ee for recording th	e enclosed ass	ignment (3			\$		
L	Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + TOTAL FEES ENCLOSED = \$ 990							
	Amount to be refunded:				\$			
				-	charged:	s		
	a. A check in the amount of \$ 990 to cover the above fees is enclosed.  b. Please charge my Deposit Account No. in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.							
	c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required by 37 CFR 1.16 and 1.17, or credit any overpayment to Deposit Account No. 25-0120. A duplicate copy of this sheet is enclosed.							
	NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.							
	SEND ALL CORRES	PONDENCE TO	:	October 2, 200	Ben	ort	Castel	
١	Young & Tho	mpson			SIGNA	TURE		
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-	2nd Floor	TA 22202			NAME			
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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Bernard FEURER et al.

Serial No. (unknown)

Filed herewith

OPTICAL SYSTEM, IN PARTICULAR INTRAOCULAR LENS, CONTACT LENS

#### PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee, please substitute Claims 1-8 as originally filed, which appear on page 12, with Claims 1 and 2 as filed in the Article 34 amendment of June 19, 2000. The page containing Claims 1 and 2 is marked "AMENDED SHEET" and is attached hereto.

#### REMARKS

The above change in the claims merely places the national phase application in the same condition as it was during Chapter II of the international phase.

Respectfully submitted,

YOUNG & THOMPSON

Benoit Castel

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October 2, 2000

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## OPTICAL SYSTEM, IN PARTICULAR INTRAOCULAR LENS, CONTACT LENS

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The present invention relates to optical systems,

in particular centered optical systems such as intraocular lenses, contact lenses, etc.

It is known that the human eye is a complex optical system whose role is to transmit to the brain the images arriving thereat. One of the essential components is the lens. The crystalline lens, located behind the iris, is a transparent gelatinous mass contained in the lens sac.

Opacification of the crystalline lens may occur with increasing age (cataract). All that can be done in that case is to remove the defective crystalline lens and replace it with an artificial crystalline lens or an intraocular lens.

The artificial crystalline lenses known to date are essentially made of acrylic materials, for example polymethyl methacrylate or copolymers thereof, or of silicone derivatives. They have relatively low refractive indices. For silicones, refractive indices of between 1.41 and 1.46 are currently available in the best of cases. For strong corrections, it is thus necessary to use intraocular lenses whose faces have a large curvature and which are consequently very thick in their optical axis.

In order to obtain the best correction without inducing astigmatism defects, it is also necessary to introduce the intraocular lens by making the smallest possible incision. To do this, flexible materials of the largest possible refractive index are sought so as to obtain a very thin intraocular lens.

In a healthy eye the crystalline lens is capable, under the action of muscles, the zonulae, which act upon the lens sac, of modifying its radius of curvature so as to adapt itself to close vision or distant vision.

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Replacing the crystalline lens with an intraocular lens no longer allows accommodation to take place.

One of the aims of the present invention is to produce an optical system such as an intraocular lens which overcomes the drawbacks of those of the prior art.

More specifically, the subject of the present invention is an optical system, in particular an intraocular lens or contact lens, characterized in that it is made of a material whose optical refractive index shows variations in at least one given direction.

According to one characteristic of the invention, the said material is a homogeneous material whose refractive index is variable as a function of its chemical composition.

According to another characteristic of the invention, the said material is a heterogeneous material with molecular orientations which vary in different zones.

According to another characteristic of the invention, the said material is a homogeneous material capable of modifying its optical refractive index when it is subjected to the action of external phenomena.

Another application is the production of bifocal contact lenses, allowing a simultaneous correction of two visual defects (for example myopia and presbyopia):

- either by juxtaposition of two materials, a central material and a peripheral material, of similar nature but of different indices, by means of different degrees of grafting onto the same matrix;
- or by juxtaposition of two different domains of the same material, the two domains having refractive indices that are different by virtue of a molecular orientation;
- or by producing a material whose index varies under the effect of a mechanical stress, for example the 35 pressure of the eyelids.

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Other characteristics and advantages of the present invention will become apparent in the course of the description which follows, given with regard to the drawings attached for illustrative but in no way limiting purposes, in which:

Figures 1 and 2 represent graphs for explaining the variations in the properties of materials used to produce an optical system such as an intraocular lens according to the invention as a function of the composition of these materials, the graph in Figure 1 showing the change in glass transition temperatures as a function of the content of substituents, and the graph in Figure 2 showing the change in refractive index  $\underline{n}$  as a function of the content of substituents.

The optical system such as the intraocular lens according to the invention is made of a material whose optical refractive index shows variations in at least one given direction.

In a first embodiment, this material is homogeneous and has a high refractive index  $\underline{n}$  which varies according to its chemical composition.

Specifically, for a given molecule, the molar refraction  $\underline{R}$  is, to a first approximation, an additive function of the contributions of the various elements present in the molecule. Among the common chemical groups, those which have the greatest effects in increasing  $\underline{R}$  are mainly sulfur, the halogens, in particular chlorine, bromine and iodine, and aromatic nuclei.

The refractive index  $\underline{n}$  of the molecule increases as  $\underline{R}$  increases, such that it is the molecules containing the elements mentioned above which have the largest indices.

Examples:	benzene	n	=	1.498
	o-dichlorobenzene	n	=	1.551
	carbon disulfide	n	=	1.628
	diiodomethane	n	=	1.749

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Similarly, the addition of groups of high refractive index  $\underline{n}$  to a polymer increases the refractive index of the material.

By way of example, mention will be made of the case of silicones substituted with 9-vinylanthracene moieties. The refractive index of the material obtained increases as the content of substituents increases:

- without substituent: n = 1.403- with 94% substituents: n = 1.690

The glass transition temperatures Tg also increase as the degree of substitution increases due to the rigidity of the aromatic nuclei:

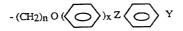
- without substituent: Ta = -130 °C

- with 94% substituents: Tg = between 10°C and 20°C

The process for manufacturing the homogeneous material having a high refractive index  $\underline{n}$  which is variable according to its chemical composition, and which is necessary for producing an intraocular lens according to the invention, comprises the following two steps:

Firstly, groups chosen from those described above, in particular aromatic nuclei whose presence also gives the material obtained the capacity to filter out ultraviolet radiation, which is an essential property for a high-quality intraocular lens, are fixed onto the polymers used for the lenses and artificial crystalline lenses, this fixing being obtained via a flexible portion so as to disrupt the temperature Tg as little as possible.

Examples: substituent of type [1]:



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substituent of type [2]:

$$(CH_2)_n$$
 $(CH_2)_n$ 
 $(CH_2)_n$ 

with  $Z = OCO, COO, -, \dots$ 

Y = H,  $OC_mH_{2m+1}$ ,  $C_mH_{2m+1}$ , ...

with n>2,  $m\ge 1$ , x=1, 2, 3, ...

Next, the degree of substitution is modified continuously, and thus also the refractive index of the material, in order to obtain copolymers with a moduleable proportion of substituted units and of unsubstituted units. In the case of silicones, it is necessary to prepare the copoly(methylhydrogenodimethyl)siloxane of variable composition beforehand.

Two examples are given below, one starting with a silicone support, the other starting with an acrylate support, the substituent chosen corresponding to formula [1] above in which n=4, Z=OCO,  $Y=OC_mH_{2m+1}$  with m=1 and x=1.

In the case of the first example, that with a silicone support, the substituent must have a vinyl end bonding group:

Example:



This group can be obtained in two steps: reaction of 4-bromobutene with hydroquinone, followed by esterification with p-methoxybenzoic acid.

The main siloxane chain has a random distribution of methylhydrogenosiloxane substitutable units and of dimethylsiloxane unsubstitutable units in variable proportion. These copolymers are obtained by acid-catalyzed

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redistribution of dimethylsiloxane units introduced in adequate amount via octamethylcyclotetrasiloxane and of methylhydrogenosiloxane units provided by homopolymethylhydrogenosiloxanes.

The substituent is fixed onto the main chain by hydrosilylation at  $60\,^{\circ}\mathrm{C}$  in the presence of a solvent. It is introduced in deficit relative to the methylhydrogenosiloxane units (from 5% to 15%) in order to allow a subsequent reaction of the excess units during the crosslinking step.

At the end of the hydrositylation reaction, the polymer is freed of virtually all of the solvent by evaporation under vacuum at room temperature. It is then mixed with a crosslinking agent, and the rest of the solvent is evaporated off under vacuum.

The crosslinking agent is preferably a flexible chain and is terminated with two vinyl ends. Its proportion is such that the amount of vinyl bonding groups corresponds to the amount of methylhydrogenosiloxane units left free.

Example of a crosslinking agent:

$$CH_2=CH (CH_2)_pCH=CH_2$$
  $p = 2 \text{ to } 20$   
 $CH_2=CH (Si (CH_3)_2O)_qCH=CH_2$   $q = 2 \text{ to } 10$ 

The polymer/crosslinking agent mixture is cast in a mold treated such that the material does not stick to the walls. The mold is placed at 60°C in an oven for several hours in order to obtain a crosslinked polymer, which is removed from the mold.

This product can be washed by swelling it with a solvent, in order to remove any unreacted molecules, followed by drying it slowly.

In the second example, that with an acrylate support, the acrylate or methacrylate monomer, bearing the chosen substituent, must be synthesized:

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with X = H,  $CH_3$ 

This group can be obtained in four steps: reaction of 4-bromobutanol in which the alcohol function has been protected, with hydroquinone; esterification with p-methoxybenzoic acid; deprotection of the alcohol function; esterification between this alcohol function and the carboxylic group of acrylic or methacrylic acid.

A bifunctional monomer containing an acrylate or methacrylate function at both ends must also be synthesized. It can be obtained according to the following scheme: reaction of 4-bromobutanol, in which the alcohol function has been protected, with hydroxybenzoic acid; esterification with the product of the reaction of 4-bromobutanol, in which the alcohol function has been protected, with hydroquinone; deprotection of the alcohol functions; esterification of these alcohol functions with the carboxylic functions of acrylic or methacrylic acid.

Other bifunctional monomers can be used: ethylene glycol dimethacrylate; triethylene glycol dimethacrylate; tetraethylene glycol dimethacrylate; 1,6-hexanediol dimethacrylate; 1,12-dodecanediol dimethacrylate.

The polymerization is initiated by heating or UV irradiation in the presence of an initiator (for example azobisisobutyronitrile) or by any other common system (chemical accelerator, microwave irradiation).

The production of crosslinked materials with a variable proportion of substituents is possible by mixing, prior to the polymerization reaction, one or more unsubstituted monomers (methyl acrylate, methyl methacrylate or hydroxyethyl methacrylate, for example) with the above monofunctional and bifunctional monomers in

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suitable proportion. Hydroxyethyl methacrylate (HEMA) gives the material a hydrophilic nature until a degree of hydration of 40% for a homopolymer is obtained. Even more hydrophilic comonomers may be combined therewith, such as N-vinylpyrrolidone (VP) for example.

The lenses or crystalline lenses can be obtained either by machining the final materials or by carrying out the final step (polymerization/crosslinking) in a mold. When the base monomer has hydrophilic properties, the final material can be swollen in aqueous medium and become more or less pliable depending on its composition.

Compared with the base acrylates or silicones, the materials thus obtained have properties which allow the preparation of artificial crystalline lenses, intraocular lenses or contact lenses according to the invention.

Specifically, their refractive index  $\underline{n}$  and their glass transition temperature Tg are higher and vary according to their chemical composition. In particular, they increase as the proportions of substituents increase.

One example of this change is illustrated in Figures 1 and 2 for the silicone materials whose method of synthesis has been given hereinabove.

In this example, the crosslinking agent is an alkyl chain; a crosslinking agent with three different chain lengths corresponding to 10, 16 or 22 carbons was studied; three different proportions of this crosslinking agent were introduced (5, 10 and 15%). These two parameters have little influence on the change in the refractive index or in the glass transition temperature, as may be seen in Figures 1 and 2.

On the other hand, the refractive index increases very rapidly as the content of substituents increases, Figure 2, since with 40% substituents, indices above 1.53 are obtained.

35 The change in the glass transition temperature,

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Figure 1, is slower. Even with total substitution, the Tg remains less than room temperature.

The mechanical properties are relatively unaffected by the substituents. For example, the modulus of elasticity under shear (G') at zero frequency:

 $G' = 10^5 \text{ Pa}$ 

silicone with more than 85%

unmodified silicone:

substituents:

 $G' = 4 \times 10^4 \text{ Pa}$ 

According to a second embodiment, the material of which the intraocular lens according to the invention is made is a heterogeneous material with a high and variable index in the material.

The aromatic substituents proposed above are thermotropic liquid crystals. They give the polymer bearing them mesomorphic properties, i.e., in particular, molecular orientation properties: within a given temperature range, these substituents very readily become oriented under the effect, for example, of a magnetic or electric field. This orientation is then "set" by the crosslinking process.

Under the orientation effect as mentioned above, the refractive index becomes anisotropic. It is thus possible, by orienting the substituents, to modify the refractive index in a given direction.

According to the present invention, the optical system is obtained from the same polymer, for example silicone or acrylate or methacrylate, by preparing batches with different indices obtained by orienting the substituents in different directions.

The orientations can be obtained by placing the substituted polymer (in the case of silicones) or the various monomers, substituted or unsubstituted (in the case of acrylates) in a weak magnetic field of about 1 Tesla or in an electric field, or by a surface treatment of the device allowing the material or lens to be manufactured in its final shape. The crosslinking (in the case of

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silicones) or the polymerization/crosslinking (in the case of acrylates) are carried out by heat treatment, for example, under this orientating field.

These batches of identical chemical nature are entirely compatible. They may be assembled so as to form lenses or crystalline lenses with different accommodation zones. For example, an intraocular lens may be produced in two parts: a central optical zone adapted for close vision and a peripheral zone adapted for distant vision.

According to a third embodiment, the material used to produce the optical system such as the intraocular lens according to the invention is a homogeneous material of high index which is variable by means of a mechanical effect, thereby allowing accommodation.

According to one characteristic of the invention, the material of which the optical system is made is a three-dimensional liquid crystal polymer whose mesomorphic moieties can be readily oriented by means of a mechanical effect.

It is possible, for example, firstly to prepare crosslinked liquid crystal polymers without prior orientation of the mesogenic units. Using this material, artificial crystalline lenses or intraocular lenses will then be produced, for example by polymerization/crosslinking in a mold or by machining depending on the properties of the material. The zonulae exert a mechanical stress which is reflected, via the lens sac, onto the crystalline lens. This stress modifies the orientation of the liquid crystal substituents and thus the refractive index in the direction of vision. Similarly, in the case of contact lenses, a pressure from the eyelids can produce mechanical deformations needed for the molecular reorientation and thus vary the refractive index and consequently the power of the lens.

It is also possible to give these materials a pre-

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orientation of the substituents during their production, which preorientation will be modified under the effect of compressions or stretches transmitted to the sac via the zonulae.

In order for the material without preorientation of the mesogenic units to be transparent, or in order for a preoriented material to remain transparent after the disorientation, it is placed in isotropic phase under the conditions of use. Furthermore, in order to obtain a sufficient orientation under stress and thus a significant modification of the refractive index, it is necessary to carry out the process in a temperature range about 10°C above the temperature T<sub>I</sub> at which the sample becomes isotropic. This obligation imposes an upper limit on the degree of substitution, as illustrated in Figure 1. In the example chosen, a siloxane modified to about 35% would be entirely suitable for use: it is isotropic at about 35°C with a refractive index of greater than 1.51 (Figure 1).

In the isotropic phase, the index variation is proportionately greater the closer the temperature of use is to  $T_1$ . An example of the difference in index between two perpendicular directions,  $\Delta n$ , induced by a mechanical stress is given below. The compound chosen corresponds to a methacrylate substituted with various groups of type [2] defined above:

at  $T_{\rm I}$  + 4°C  $\Delta n = 6 \times 10^{-3}$  for a stress of 5 × 10<sup>-2</sup> N.mm<sup>-2</sup>  $\Delta n = 2 \times 10^{-3}$  for a stress of 2 × 10<sup>-2</sup> N.mm<sup>-2</sup> at  $T_{\rm I}$  + 25°C  $\Delta n = 1 \times 10^{-3}$  for a stress of 5 × 10<sup>-2</sup> N.mm<sup>-2</sup>  $\Delta n = 0.3 \times 10^{-3}$  for a stress of 2 × 10<sup>-2</sup> N.mm<sup>-2</sup>

#### CLAIMS

- Optical system such as an intraocular lens made of a homogeneous material whose optical refractive index
   shows variations in at least one given direction, characterized in that the said index is high and variable under the action of mechanical effects.
- Optical system according to claim 1, characterized in that the homogeneous material consists of at least one three-dimensional liquid crystal polymer material.

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# Declaration and Power of Attorney for Patent Application Declaration et Pouvoirs pour Demande de Brevet

### French Language Declaration

Sir peri dan inti annert transfer et al sanita anner ha an bitan	
acté que:	
Mon domicile, mon adresse postale et ma nationalité sont ceux	My residence, post office address and citizenship are as stated

next to my name,

lens, contact lens

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom,

District our l'inventour commé ci après la déclare con le referent

Il Je crois être le premier invanteur original et unique (si un seul anom est mentionne ci-dessous), ou l'un des premiers coliquenteurs originaux (si plusieurs noms sont mentionnés cili dessous) de l'objet revendiqué, pour lequel une demande de le brevet a été déposée concernant l'invention intimitée.

il et dont la description est fournie ci-joint à moins que la case suivante n'ait été cochée:

a été déposée le sous le numéro de demande des Etats-Unis ou le numéro de demande international PCT et modifiée le (le cas échéant).

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises, telles que modificas par toute modificacion dont il aura été fair référence ci-dessus.

Je reconnais devoir divulguer toute information pertinente à la bravetabilité, comme défini dans le Titre 37, § 1.36 du Code fédérai des réglementations. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patter is sought on the invention entitle.

As a helosy named inventor. I hereby declare that-

Optical system, in particular intraocular

the specification of which is attached hereto unless the following box is checked:

was filed on \_April lar, 1999 as United States Application Number or PCT International Application Number PCT/FR99/00264 and was amended on (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

Lacknowledge the duty to disclose information which is material to parentability as defined in Title 37. Code of Federal Regulations, § 1.56.

Form PTO/SB/105(2-98)

Page 1 of 3

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#### rench Language Declaration

Cir.

la revendique per le présent acte avoir la priorité d'anggère, en rem du Titre 55, § 19(4)-(d) to § 365(b) du Code de Etasliant de la companyation de la companyati I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365 (b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States, listed below, and have slow identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

			Priority ct	aimed
Prior foreign applica	lions		Droit de p	oriorité
Demande(s) de bre	vet anteneure(s) dans u	n autre pays:	revend	iqué
9804109 (Number) (Numero)	FRANCE (Country) (Pays)	Apr 1 2 1998 (DayMonthYear Filed) (Jour Mois/Année de dépôt)	Yes Ou	Non No
(Number) (Numbro)	(Country) (Pays)	(Day/MonthYear Filed) (Jour/Mois/Annee de dépot)	Yeş Qui	
(Number)	(Country)	(Day:MonthYear Filed)		No.

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Biats-Unis, de toute dernande de brevet provisoire effectuée aux Etats-Unis et figurant oi-dessous. Thereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application No.)
(N° dc demande)

(Application No.)
(Application No.)
(N° dc demande)

(Date dc dépôt)
(Date dc dépôt)

(i) le evendique par le présent acte tout bénéfice, en vertu du Tire 35, \$100 du Code des Eusta-Vius, de toute demande de brevet 55, \$100 du Code des Eusta-Vius de toute demande de brevet entre aux Flats-Vius, ou en vertu du Tire 25, \$256(e) du prise Code, de toute demande internationale PCT designant les Eust-Vius et figurant ci-dessous et, dans la mesure où l'objet de chainen des reverdications de oetre detrande de brevet n'est pas divulges dans la demande autérietre américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, \$112 du Code des Etats-Unis, je reconnais devoir divulguer unte information perfunctes à la brevetabilité, comme défini dans le Tire 37, \$1.55 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande nativieure et la date de dépôt de la demande nativieure et la la présente demande:

(Application No.)
(N° de demande)
(Date de dépôt)
(Application No.)
(N° de demande)
(Coate de dépôt)
(Coate de dépôt)
(Coate de dépôt)

Je déclars pur le présent acte que toute déclaration ci-neuse est, à ma connaissance, vérifquée et que toute déclaration formulée à pardir de renseignements ou de suppositions est tenue pour vérifque; et de plus, que toutes ces déclarations nois été formulées en sachant que toute fausse déclaration noi cet formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amande ou d'une incacération, ou des deux, en verm de la Section 1001 du Titre 18 du Code des Etats-Unis, or que de telles déclarations volontairement fausses risquent de compromettre la validité de la detrande de brevet ou qui brevet déjivée à partir de celle-ci. I herchy claim the bearfit under Title 35. United Stares Code, 8 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35. United States Code, § 112, I zeknowledge the duty to disclose information which its material to patentially as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Status) (patented, pending, abandoned) (Statut) (breveté, en cours d'examen, abandonné)

(Status) (patented, pending, abandoned) (Status) (breveté, en cours d'examan, abandonné)

I hereby declare that all statements made harcin of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by find the proportion of both, under Section 100 to 100 to 100 to imprisonment, or both, under Section 100 to 100 to 100 to imprisonment on the statements may jeopardize the validity of the application or any patent issued thereon.

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#### French Language Declaration

POUVOIRS: En tant que l'inventeur cité, le désigne par la préente l'ilée à avocatis eléou agentis s'avantis pour qu'ils poursuive(nt) la procédure de cette demande de brovet et traisfe(nt) toute affaire s'y maportant avec l'Office des brevets et des marques: (mentionner le nom et le numéro d'enregistrement).

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following automores) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)

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